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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/043,739	01/09/2002	Masayoshi Nakagawa	9281-4241	6542

7590            11/18/2002  
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EXAMINER	
DOLAN, JENNIFER M	
ART UNIT	PAPER NUMBER
2813	
DATE MAILED: 11/18/2002	

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.	Applicant(s)	
10/043,739	NAKAGAWA ET AL.	
Examiner	Art Unit	
Jennifer M. Dolan	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) Responsive to communication(s) filed on 30 July 2002.
- 2a) This action is FINAL.      2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1-14 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) The proposed drawing correction filed on \_\_\_\_\_ is: a) approved b) disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some \* c) None of:
- 1.) Certified copies of the priority documents have been received.
- 2.) Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
- 3.) Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) The translation of the foreign language provisional application has been received.
- 15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) Notice of References Cited (PTO-892)      4) Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_ .
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)      5) Notice of Informal Patent Application (PTO-152)
- 3) Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.      6) Other: \_\_\_\_\_

## DETAILED ACTION

*This action is in response to Amdt. A, filed 7/30/02.*

### ***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in–

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

2. Claims 8 and 14 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent Application Publication No. US 2001/0004303 to Wada et al.

Regarding claim 8, Wada discloses a magnetic head actuator having a finely movable tracking device (paragraph 0033, lines 1-5), comprising: a swing arm (main actuator in paragraph 0034) having a magnetic head (12a) at a free end reciprocally movable around a coarse rotation axis of a base of the swing arm (paragraph 0034, lines 1-3); a piezoelectric element (11) mounted in the swing arm (figures 1 and 4), the piezoelectric element having a voltage-impressing electrode (22, paragraph 0053, lines 3-9) for allowing a fine arcuate movement of the free end around the coarse rotation axis in response to an applied voltage (paragraph 0055, lines 6-25 and paragraph 0056, lines 1-6); and an FPC board (18a-c) having a resin base and a feeding line (end of 18b, 22) embedded in the resin base (paragraph 0042, lines

9-14) for feeding power to the voltage-impressing electrode (paragraph 0043, lines 4-7), wherein the feeding line resides completely within the FPC board (18; figures 2 and 3) except for an exposed portion (end of 18(b) touching 22, 22; paragraph 0042, lines 14-18; figures 2 and 3) extending onto the voltage-impressing electrode, and wherein the exposed portion is bonded to the piezoelectric element by a direct electrical connection between the voltage-impressing electrode and the exposed portion (paragraphs 0042 and 0047; figures 2 and 3).

Regarding claim 14, Wada discloses a trace line (18a) leading to the magnetic head and extending, together with the feeding line (18b) in the FPC board (figure 2).

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 6, 7, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wada et al. in view of U.S. Patent No. 6,233,124 to Budde et al.

Regarding claim 1, Wada discloses a magnetic head actuator having a finely movable tracking device (paragraph 0033, lines 1-5), comprising: a swing arm (main actuator in paragraph 0034) having a magnetic head (12a) at a free end reciprocally movable around a coarse rotation axis of a base of the swing arm (paragraph 0034, lines 1-3); a piezoelectric element (11) having a voltage-impressing electrode (22, paragraph 0053, lines 3-9) for allowing a fine arcuate movement of the free end around the coarse rotation axis in response to an applied

voltage (paragraph 0055, lines 6-25 and paragraph 0056, lines 1-6); and an FPC board (18a-c) having a resin base and a feeding line (end of 18b, 22) embedded in the resin base (paragraph 0042, lines 9-14) for feeding power to the voltage-impressing electrode (paragraph 0043, lines 4-7), wherein a portion of the resin base is removed to expose a portion of the feeding line that extends onto the electrode (end of 18(b) touching 22, 22; paragraph 0042, lines 14-18; figures 2 and 3) extending onto the voltage-impressing electrode, and wherein there is a direct electrical connection between the voltage-impressing electrode and the exposed portion of the feeding line (paragraphs 0042 and 0047; figures 2 and 3).

Wada fails to disclose that the piezoelectric element is suspended between two sections of the swing arm by an adhesive.

Budde discloses a piezoelectric element suspended between two sections of the swing arm by an adhesive (column 4, lines 3-11; figures 2 and 3).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the piezoelectric element of Wada such that it is suspended between two sections of the swing arm by an adhesive, as taught by Budde. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to suspend the piezoelectric element between two sections of the swing arm by an adhesive, because doing so allows for efficient head positioning and a large range of motion for the head (Budde, column 1, lines 50-55). By suspending the piezoelectric component between two sections of the swing arm rather than embedding it at the end of the swing arm, longer piezoelectric elements can be used, and the amount of displacement of the head slider can be increased (Budde, column 4, lines 3-57).

Regarding claims 6 and 13, Wada fails to disclose a pair of piezoelectric elements having polarities opposite to each other.

Budde discloses a pair of piezoelectric elements having opposite polarities (column 4, lines 24-27).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the piezoelectric structure of Wada such that it comprises a pair of piezoelectric elements having opposite polarities, as taught by Budde. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to provide a pair of piezoelectric elements with opposite polarities so that with the application of a voltage, one element will expand while the other element contracts (Budde, column 4, lines 25-36), generating a larger amount of torque in the head suspension for the same voltage when compared with a pair of electrodes having the same polarity.

Regarding claim 7, Wada discloses a trace line (18a) leading to the magnetic head and extending, together with the feeding line (18b) in the FPC board (figure 2).

5. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wada et al. in view of U.S. Patent No. 5,815,347 to Pattanaik.

Regarding claim 11, Wada discloses that the electrical connection between FPC feeding lines and magnetic head element electrodes is made using a gold ball (paragraph 0044, lines 1 – 7).

Wada fails to disclose a through-hole in the exposed portion of the feeding line, wherein the electrical connection is made using a gold ball is positioned in the through-hole.

Pattanaik discloses a through-hole (8) in a bonding section of flex cable (9, column 7, lines 30 – 40; figures 7 and 8b), wherein the electrical connection between the flex cable traces and the termination pads (5) of a magnetic head element is made using a conductive ball positioned in the through-hole (column 8, lines 21 – 27).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the magnetic head actuator of Wada such that a through hole is provided in the feeding line, wherein the electrical connection is made using a conductor positioned in a through hole, as taught by Pattanaik. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to provide a through hole in the feeding line, with a ball connection in the through hole, because a connection of this type form a very solid electrical and mechanical connection (Pattanaik, column 9, lines 15 – 22), simplify the manufacturing process of the suspension, and have relaxed alignment requirements (column 9, lines 8 – 10).

Regarding claim 12, Wada discloses an electrical connection between the exposed portion of the feeding line and the voltage impressing electrode, as explained supra.

Wada fails to disclose a stud bump made of conductive material residing on the piezoelectric element and a through-hole located in the exposed portion of the feeding line.

Pattanaik discloses a stud bump (4) made of conductive material (column 8, line 17) residing on an electrode of a magnetic head element (column 8, lines 21-22) and a through hole (8) located in a connection portion of the flex cable (9), wherein the electrical connection is made by positioning the stud bump in the through hole (column 8, lines 14 – 27).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the magnetic head actuator of Wada such that it includes a stud bump on the piezoelectric element electrode and a through hole in the FPC, as taught by Pattanaik. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to provide an electrical connection comprising a stud bump placed in a through hole, because such a connection results in a very solid electrical and mechanical connection (Pattanaik, column 9, lines 15 – 22).

6. Claims 2 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wada et al. in view of U.S. Patent No. 6,019,271 to Hayden et al.

Wada fails to disclose that the electrical connection comprises an ultrasonic bond, wherein a portion of the material of the feeding line resides in the voltage impressing electrode.

Hayden discloses an electrical connection comprising an ultrasonic bond, wherein a portion of the material of the feeding line resides in the voltage impressing electrode (column 1, lines 11-67).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the electrical bond of Wada such that the connection is an ultrasonic bond, as taught by Hayden. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to use an ultrasonic bond, because ultrasonic bonding is frequently used in electronics to bond flex circuits to terminals (Hayden, column 1, lines 43-49), and ultrasonic bonding tends to be less damaging to the flex circuit or component substrates than comparable bonding methods (Hayden, column 1, lines 55-60).

7. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wada et al. in view of Budde et al.

Wada discloses that the electrical connection between the magnetic head slider and the FPC feeding line comprises an Au ball bond (paragraph 0044, lines 1 – 7). Wada is silent as to the means by which the piezoelectric element electrodes are connected to the FPC trace lines. The electrical connection between the FPC and the piezoelectric element is considered to comprise Au ball bonds. Assuming arguendo, the elements are connected by a means other than Au ball bonding.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to specify that the connection between the FPC feeding line and the piezoelectric element electrode of Wada as modified by Budde comprises an Au ball bond. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to provide an Au ball bond, because Wada teaches that Au ball bonding provides adequate electrical connections between magnetic head elements and FPC lines (paragraph 0044).

8. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wada et al.

Wada discloses that the electrical connection between the magnetic head slider and the FPC feeding line comprises an Au ball bond (paragraph 0044, lines 1 – 7). Wada does not specify the means by which the piezoelectric element electrodes are connected to the FPC trace lines. The electrical connection between the FPC and the piezoelectric element is considered to

comprise Au ball bonds. Assuming arguendo, the elements are connected by a means other than Au ball bonding.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to specify that the connection between the FPC feeding line and the piezoelectric element electrode of Wada comprises an Au ball bond. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to provide an Au ball bond, because Wada teaches that Au ball bonding provides adequate electrical connections between magnetic head elements and FPC lines (paragraph 0044).

9. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wada et al. in view of Budde et al., as applied to claim 1, supra, and further in view of U.S. Patent No. 5,815,347 to Pattanaik.

Regarding claim 4, Wada discloses that the electrical connection between FPC feeding lines and magnetic head element electrodes is made using a gold ball (paragraph 0044, lines 1 – 7).

Wada fails to disclose a through-hole in the exposed portion of the feeding line, wherein the electrical connection is made using a gold ball is positioned in the through-hole.

Pattanaik discloses a through-hole (8) in a bonding section of flex cable (9, column 7, lines 30 – 40; figures 7 and 8b), wherein the electrical connection between the flex cable traces and the termination pads (5) of a magnetic head element is made using a conductive ball positioned in the through-hole (column 8, lines 21 – 27).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the magnetic head actuator of Wada as modified by Budde, such that a through hole is provided in the feeding line, wherein the electrical connection is made using a conductor positioned in a through hole, as taught by Pattanaik. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to provide a through hole in the feeding line, with a ball connection in the through hole, because a connection of this type form a very solid electrical and mechanical connection (Pattanaik, column 9, lines 15 – 22), simplify the manufacturing process of the suspension, and have relaxed alignment requirements (column 9, lines 8 – 10).

Regarding claim 5, Wada discloses an electrical connection between the exposed portion of the feeding line and the voltage impressing electrode, as explained supra.

Wada fails to disclose a stud bump made of conductive material residing on the piezoelectric element and a through-hole located in the exposed portion of the feeding line.

Pattanaik discloses a stud bump (4) made of conductive material (column 8, line 17) residing on an electrode of a magnetic head element (column 8, lines 21-22) and a through hole (8) located in a connection portion of the flex cable (9), wherein the electrical connection is made by positioning the stud bump in the through hole (column 8, lines 14 – 27).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the magnetic head actuator of Wada as modified by Budde, such that it includes a stud bump on the piezoelectric element electrode and a through hole in the FPC, as taught by Pattanaik. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to provide an electrical connection comprising a

stud bump placed in a through hole, because such a connection results in a very solid electrical and mechanical connection (Pattanaik, column 9, lines 15 – 22).

*Response to Arguments*

10. Applicant's arguments filed 7/30/02 have been fully considered but they are not persuasive.

Regarding claims 1 and 8, the Applicants argue on page 3 that "Wada et al. differs from their claimed invention at least because Wada et al. teaches the attachment of the second conductor member (800(b)) to actuator connection pads (22). The connection pads (22) are, in turn, connected to the terminal electrodes of the actuator (11). In contrast, the magnetic head actuator of the instant invention includes an electrical connection directly between the feeding line and the voltage-impressing electrode."

This argument is not persuasive, because regardless of whether the connection pads (22) are considered to be the voltage impressing electrodes, such that the connection is direct both electrically and physically, or whether the connection pads are considered to be an intermediary member between the feeding line (18b) and the voltage impressing electrodes, such that there is no longer a direct physical connection between the feeding line and electrode, the electrical connection is still a direct connection. Adding wiring or any nonparasitic conductive component between two components maintains a direct electrical connection between the two components, because any currents or voltages applied to the one component will flow directly and unimpeded, to the other component. A lack of a direct physical connection does not equate to a lack of a direct electrical connection. In the instant case, feeding line (18b) is connected to the

piezoelectric through conductive electrodes (22). Because there are no components to alter the current or voltage characteristics between the feeding line and the piezoelectric component, the electrical connection is considered to be direct.

Regarding claims 3 and 10, the Applicant argues on page 4 that “Wada et al. does not specify the means by which the piezoelectric element electrodes are connected to the FPC trace lines. In view of the failure of Wada et al. to suggest or disclose a direct electrical connection made by Au ball bond, the Applicants respectfully assert that claim 3 distinguishes over Wada et al.”

This is not persuasive, because while it is acknowledged that Wada is silent as to how the FPC trace line is connected to the piezoelectric element electrodes, Wada does, in fact, disclose an Au ball bond used as a direct electrical connection between FPC trace lines and magnetic head components (Wada, paragraph 0044, lines 1 – 7). In item 4 of the office action of 4/24/02, the Examiner asserted that because Wada teaches that Au ball bonding provides good electrical connection between FPC feeding lines and magnetic head elements, it is reasonable and not unobvious to use an Au ball bond to join an FPC feeding line and the piezoelectric element, which is essentially a magnetic head element. The Applicants’ arguments for claims 3 and 10 are not completely responsive to the office action, in that the Applicants only point out presence and absence of claimed elements, but do not address the issues of obviousness raised in the prior office action.

11. Applicant's arguments with respect to claims 2 and 9 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Examiner's remarks: The inclusion of the limitation that the piezoelectric element is suspended between two sections of the swing arm by an adhesive in claim 1, and the structural limitations added to claims 2 and 9 necessitated new grounds of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Dolan whose telephone number is (703) 305-3233. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead, Jr. can be reached on (703) 305-4940. The fax phone numbers

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for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Jennifer M. Dolan  
Examiner  
Art Unit 2813

jmd  
November 13, 2002

*Carl Whitehead*  
CARL WHITEHEAD, JR.  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800